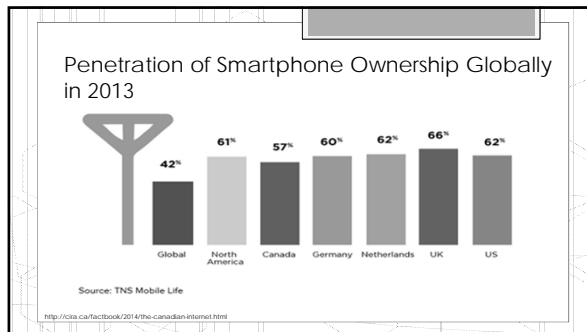


**Nurses' Use of iPads for Clinical Documentation: A Usability Study**

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**Overview**

- Introduction
- Methods
- Results
- Discussion
- Implications
- Summary

**Mobile Devices: Potential Positive Clinical Impact**

- Increase efficiency and patient safety
- Improve evidence-based practice
- Provide timely access to information
- Use of clinical decision support
- Freedom and mobility
- Improve productivity in practice
- Support clinical decision support

## What is Usability?

Usability is "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use."  
(International Organization for Standardization, 1998).

Usability goals:

1. Satisfaction
2. Efficiency
3. Errors
4. Learnability
5. Memorability

## Bad Design Example



## Mobile Devices: Usability Problems

Navigation

- Scrolling
- Tapping on text or link

Data Entry

- Typing errors
- Difficulty using stylus/handwritten letters
- Highlighting text

Screen Size

- Screen display and font size too small

Login

- Time-consuming login process

System/Device

- Slow computing speed
- Poor wireless connectivity
- Unresponsive application
- Poor battery life
- Heavy device



## Usability Testing

- Observe end users in using the product
- Help researchers obtain quantifiable results and identify usability violations
- Can be used in different phases of product development
- Cost-effective way to gather end-user's input
- Can reveal up to 80-95% of errors
- Results help to redesign and improve the product

## Purpose of Study

To examine how nurses use an iPad for clinical documentation in the acute care setting.



## Setting

- Tertiary facility in Western Canada
- 47 Bed acute surgical unit
- Paper- and electronic-based clinical documentation
- Part of a larger study

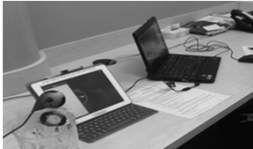


## Materials

- For Recording
  1. Laptop with webcam
  2. Morae™ software
- For Usability Testing/Clinical Documentation
  1. 2<sup>nd</sup>-generation iPad
  2. Bluetooth external keyboard
  3. Rounded tip stylus
- For Wi-Fi Connectivity
  1. Workstation-on-Wheel as proxy to connect to wireless network

## Usability Testing Methods

- One participant per session
- Video-recording and audio-recording via webcam connected to laptop
- Use of Morae™ Recorder

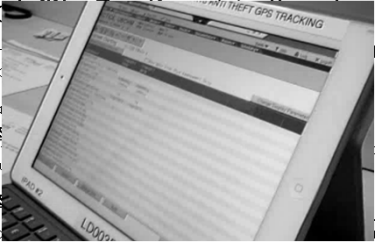


## Usability Testing Methods – Coding Scheme

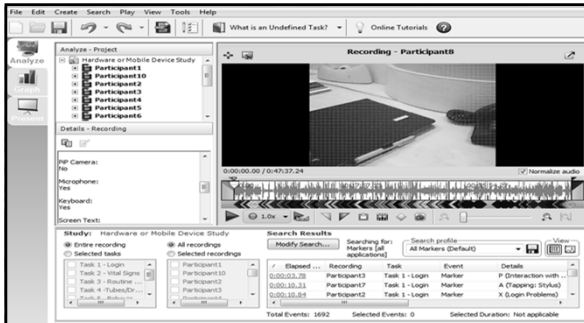
- 4 categories of codes:
  1. Navigation (n=7 codes)
    - Two codes for extra taps
  2. Modifying Screen Size (n=3 codes)
  3. Data Entry (n=3 codes)
  4. Additional Codes (n=4 codes; e.g., login problems)
- Total of 17 codes

## Usability Testing Methods – Coding Scheme

- Fictional task
- Example: "IAs" and "De" and "an" and "very" and "gnoses."



Emotional support was provided and time spent to answer questions and provided education."

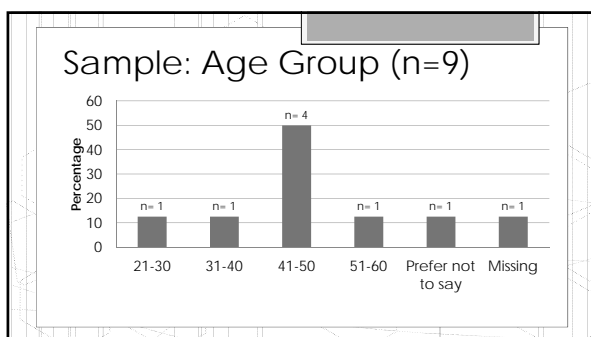
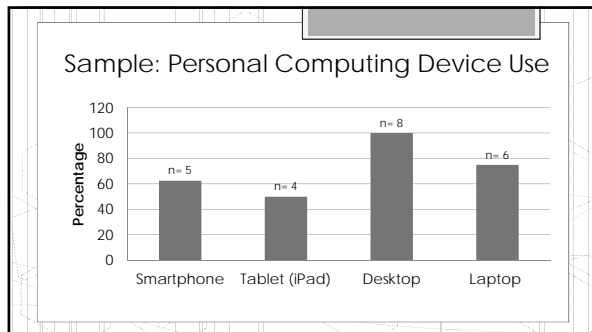


Task	Participant	Elapsed	Recording	Task	Event	Details
Task 1 - Login	Participant10	0:00:20.28	Participant3	Task 1 - Login	Marker	F (Interaction with ...)
Task 2 - Virtual Signin	Participant12	0:00:30.31	Participant7	Task 1 - Login	Marker	A (Tapping Stylus)
Task 3 - Rotate	Participant13	0:00:30.88	Participant2	Task 1 - Login	Marker	X (Login Problems)

Total Events: 1692 Selected Events: 0 Selected Duration: Not applicable



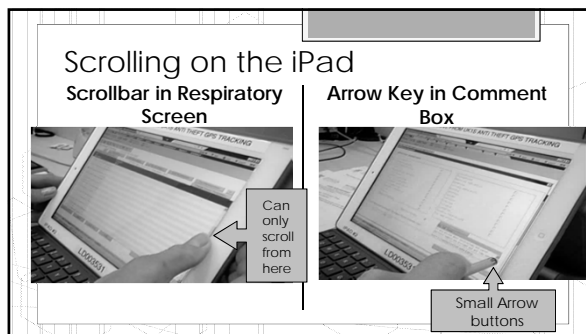
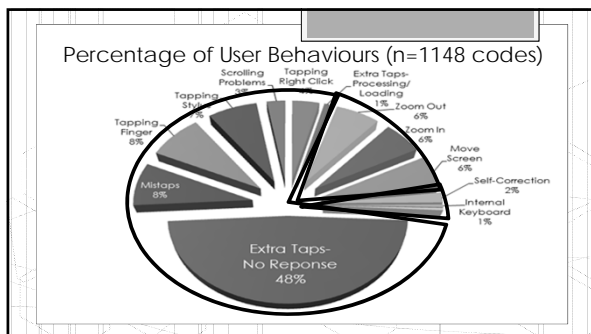
## Results



### Time on Task (min:sec)

Task and Sequence	Median	Min	Max
1. Login	5:07	2:11	11:22
2. Vital Signs <sup>a</sup>	3:10 <sup>a</sup>	1:56 <sup>a</sup>	7:26 <sup>a</sup>
3. Routine Assessment	9:19	4:53	14:22
4. Tubes/Drains	2:08	1:16	3:54
5. Behavior/Mood	3:08	1:47	5:07
6. Order Entry	5:10	1:16	8:34
7. Logout	3:30	1:24	13:57
<b>Median time for Completion</b>	<b>30:07<sup>a</sup></b>	<b>18:07</b>	<b>53:37</b>

<sup>a</sup>An outlier for vital signs task (15:49) was omitted above due to technical difficulties during task.



### Frequencies of Navigational Behaviour

User Behaviours	Frequencies	Percentage
Extra Taps- No response	553	48%
Mistaps	94	8%
Tapping finger	94	8%
Tapping stylus	81	7%
Tapping Right Click	44	4%
Scrolling problems	30	3%
Extra Taps- Processing/Loading	9	1%
<b>Total</b>	<b>905</b>	<b>79%</b>

### Frequencies of Modifying Screen Size Behaviours

User Behaviours	Freq	%
Zoom out	73	6%
Zoom In	68	6%
Move screen	69	6%
<b>Total</b>	<b>210</b>	<b>18%</b>


• Nurses stated not "comfortable" with having to modify screen size

#### Data Fields on Vital Signs Documentation Screen

### Frequencies of Data Entry Behaviours

User Behaviours	Freq	%
Self-correction	22	2%
On-screen keyboard	6	1%
Keyboard shortcut	5	0%
<b>Total</b>	<b>33</b>	<b>3%</b>

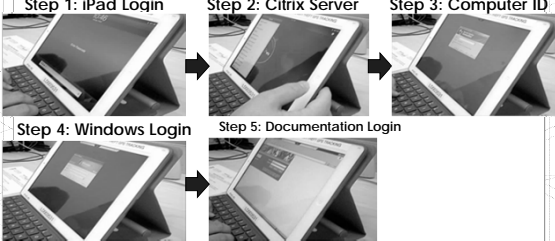
**F12 Function**



- Different function for saving free-text documentation
- Self-correction related to use the system, not iPad interface

## Discussion

### Login (approx. 5 mins)



Step 1: iPad Login    Step 2: Citrix Server    Step 3: Computer ID

Step 4: Windows Login    Step 5: Documentation Login

### Navigational Problems

- Windows platform is good for using mouse, not finger
- Switching between stylus and finger input was a source of frustration
- Scrolling on a touch-based device while running Windows
- "Fat Finger" Problem
  1. A large area of the user's finger comes into contact with the touch screen
  2. The user's finger occludes where the user is tapping exactly.

## Screen Size

- Desktop screen fitted onto the iPad
- Observations
  1. Loss of patient identifier on the screen when zoomed in
  2. Small font size, harder to read
  3. Nurses' posture leaning into the screen
- Changing the screen size and moving the screen around is disruptive to charting

## Implications

- Usability testing is essential prior to implementation
- Need to test the clinical documentation system on a mobile device
- Mobile devices may benefit from drop-down menus rather than free-text entries
- Need robust organizational and technical support
- The user interface should be consistent across all devices (e.g., login, saving)
- Further research is required

## Data Entry

- Small external keyboard
- Confusion when on-screen keyboard activated
- Different process for in the saving free-text entries

## Summary

- Increase use of mobile devices in health care
- Need for usability testing of devices to determine fit with current software used, and clinical settings
- Testing revealed multiple usability problems in areas such as navigation, data entry, screen size and login.
- Improvements are required before enterprise-wide implementation of mobile devices



## Acknowledgement

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## References

- Canadian Internet Registration Authority (n.d.). FACIBOOK 2014 - The Canadian Internet. Retrieved May 26, 2014, from <http://cira.ca/factbook/2014/the-canadian-internet.html>
- Epocrates. (2013). Epocrates 2013 Mobile Trends Report. Retrieved from [http://www.epocrates.com/oldsite/statistics/2013%20epocrates%20Mobile%20Trends%20Report\\_FINAL.pdf](http://www.epocrates.com/oldsite/statistics/2013%20epocrates%20Mobile%20Trends%20Report_FINAL.pdf)
- Cockburn, A., Ahlstrom, D., & Gutwin, C. (2012). Understanding performance in touch selections: Tap, drag and radial pointing drag with finger, stylus and mouse. *International Journal of Human-Computer Studies*, 70(3), 218-233. doi:10.1016/j.ijhcs.2011.11.002
- Dawson, J., & Kushniruk, A. (2009). Improving the efficiency and accuracy of a tablet PC interface for computerized provider order entry through usability evaluation and provision of data entry strategies. *Studies in Health Technology and Informatics*, 143, 441-452.
- Faulkner, L. (2003). Beyond the five-user assumption: Benefits of increased sample sizes in usability testing. *Behavior Research Methods, Instruments, & Computers*, 35(3), 379-383. doi:10.3758/BF03195514
- International Organization for Standardization. (1998). ISO 9241-11:1998 (en) Ergonomic requirements for office work with visual display terminals (VDTs)- Part 11: Guidance on usability. Retrieved August 27, 2013, from <https://www.iso.org/obp/ui/#iso:std:iso:9241-11:ed-1:v1:en>
- Nielsen Norman Group. (2012). Usability 101: Introduction to Usability. Retrieved August 27, 2013, from <http://www.nngroup.com/articles/usability-101-introduction-to-usability/>
- Waeger, K., Schaffner, M., Foulis, B., Swanson Kadey, A., Parker, C., & Walo, H. (2010). Comparison of the quality and timeliness of vital signs data using three different data-entry devices. *Computers, Informatics, Nursing*, 28(4), 205-212. doi:<http://dx.doi.org/10.1097/NCN.0b013e3181e1d119>
- Wigdor, D., & Wilson, D. (2011). *Breve Null Word: Designing Natural User Interfaces for Touch and Gesture*. Morgan Kaufmann Publishers.



Questions?